

REMARKS

Herein, the "Action" or "Office Action" refers to the Office Action dated 3/4/2004.

Applicant respectfully requests reconsideration and allowance of all of the claims of the application. Claims 1-15 and 18-22 are presently pending. Claims amended herein are 1, 4, 5, 9, 11, 13, 18, and 21. Claims withdrawn or cancelled herein are none. New claims added herein are none.

Formal Claim Rejections

Claim Rejections under §112

Claims 9 and 13-15

The Office rejects claims 9 and 13-15 under 35 USC § 112, second paragraph, as failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In particular, the Office indicates that claims 9 and 13 contain the limitation "d-label matching blocks between first and second CFG representations." The Office indicates that is unclear what it means to "d-label match blocks" in the context of this claim. The Office asks if this means "attempting to match two blocks by comparing their d-label? If so, this should be specified clearly in the claim."

Accordingly, Applicant amends these claims to clarify.

1 Furthermore, the Office indicates that claim 13 receives “the labels of the
2 blocks”, but it lacks sufficient antecedent basis for this limitation. Claims 14 and
3 15 are rejected because they depend upon claim 13.

4 Accordingly, Applicant amends claim 13 to clarify.

5 6 7 **Substantive Claim Rejections**

8 **Claim Rejections under §102 and § 103**

9 The Office rejects all of the pending claims under §102. For the reasons set
10 forth below, the Office has not shown that cited references anticipate (under §102)
11 the rejected claims. Furthermore, for the reasons set forth below, the Office has
12 not shown the *prima facie case* for obviousness (under §103) of the rejected
13 claims. Accordingly, Applicant respectfully requests that the rejections be
14 withdrawn and the case be passed along to issuance.

15 The Office’s rejections are based upon the following reference:

- 16 • **Schweitz:** *Schweitz et al.*, US Patent No. 6,594,822;
- 17 • **Chipman:** “A Graph Theoretic Approach to Scene Matching”,
18 Chipman, Laure J., Ph.D., The University of Alabama in Huntsville,
19 1990.

20 21 **Overview of the Application**

22 The Application describes a technology for generating a minimum delta
23 between at least two program binaries. The Application describes an
24 implementation that is given a source program (S) in a binary format and a target
25

1 program (T) in a binary form. It constructs control flow graphs (CFGs) of each. It
2 matches common blocks of the S's CFGs and T's CFGs. The blocks are matched
3 based upon their content and their local neighborhoods (e.g., *d*-neighborhoods).

4 In addition, blocks are matched using labels, which are based upon
5 computed hash values. The matching is done in multiple passes where each pass
6 improves the matching by relaxing the criteria for a match. In addition, the register
7 renaming problems is solved so that blocks can be fairly compared.

8 The Application describes a technology that produces an intermediate
9 output, which is the content of unmatched blocks. Such unmatched blocks are
10 those found in T that are not found in S. It generates a set of edge edit operations
11 for merging the unmatched blocks into S. The combination of the unmatched
12 blocks and the edit operations is the delta. To patch S to produce a reconstructed
13 copy of T, the delta is merged with S.

14 15 Cited References

16 The Office cites **Schweitz** as its primary references in its anticipation-based
17 rejections. Furthermore, it cites **Chipman** in combination with **Schweitz** for its
18 obviousness-based rejections.

19 20 Schweitz

21 **Schweitz** describes a technology for creating a software patch by
22 comparing object files. Method and apparatus are provided that create a software
23 patch using object files of two software sources. **Schweitz** creates software
24 patches for software programs written any high-level language so long as the
25

1 programs compile to a standard object file format, and required information can be
2 recovered.

3 Functions of a compiled version of an existing software program are
4 compared with an updated version that is compiled in a separate object file to
5 discover a minimal set of changes, or "deltas" (for the patching process). The
6 process for creating a patch includes decomposing the object file into cantles,
7 examining fix-up information, creating reduced program dependency graphs, and
8 comparing the graphs to determine the changes and create the patch. Because the
9 software has already been compiled into object files, **Schweitz** is source-code
10 independent and can be applied to code written in C/C++, Pascal or even to other
11 specific proprietary languages.

12 13 Chipman

14 **Chipman** describes techniques related to computer vision, which may be
15 defined as "the analysis of image content--the conversion of pictures into
16 descriptions." In particular, **Chipman** is addressing problems associated with
17 computer vision tasks such as automated navigation, object location in the real
18 world, pictorial databases, and character recognition.

19 **Chipman** discusses that the ability to match two scenes is a fundamental
20 requirement in a variety of computer vision tasks. **Chipman** presents a graph
21 theoretic approach to inexact scene matching which is useful in dealing with
22 problems due to imperfect image segmentations.

Anticipation Rejections

Based upon Schweitz

The Office rejects claims 1-4, 7, 11, 12, and 18-22 under USC § 102(b/e) as being anticipated by **Schweitz**. Applicant respectfully traverses the rejections of these claims. Based on the reasons given below, Applicant asks the Office to withdraw its rejection of these claims.

Claim 1

With the cited portions of **Schweitz** provided in brackets, this amended claim recites [with emphasis added]:

- obtaining a first control flow graph (CFG) representation of the first binary and obtaining a second CFG representation of the second binary; **[Fig. 2, item 150 and 155]**
- comparing the first and second CFG representations to identify blocks (nominally matched blocks) that match in the first and second CFG representations, thereby identifying blocks (nominally unmatched blocks) in the second CFG representation that do not match in the first CFG representation **[Col. 4, lines 28-29]**, *the comparing being based upon content of blocks being compared and local neighborhoods of blocks surrounding blocks being compared, wherein a local neighborhood of a particular block consists*

1 *of blocks neighboring that block in a CFG representation, but*
2 *less than all the blocks in that CFG representation;*

- 3 • determining edit-operations that merges the unmatched
4 blocks into the first CFG representation so that first CFG
5 representation is substantially identical to the second CFG
6 representation; [Col. 4, lines 29-32]
- 7 • producing a delta comprising the unmatched blocks and the
8 edit-operations. [Col. 4, lines 11-15]

9
10 Applicant submits that **Schweitz** does not disclose that the comparison is
11 “based upon content of blocks being compared and local neighborhoods of blocks
12 surrounding blocks being compared, wherein a local neighborhood of a particular
13 block consists of blocks neighboring that block in a CFG representation, but less
14 than all the blocks in that CFG representation.”

15 Indeed, **Schweitz** is silent on the subject of neighborhoods of blocks and
16 any comparison related to them.

17 As shown above, **Schweitz** does not disclose all of the claimed elements
18 and features of the claim. Accordingly, Applicant asks the Office to withdraw its
19 rejection of this claim.

20
21 Claims 2-7

22 These claims ultimately depend upon independent claim 1. As discussed
23 above, claim 1 is allowable.
24
25

1 In addition to its own merits, each of these dependent claims is allowable
2 for the same reasons that its base claim is allowable. Applicant submits that the
3 Office withdraw the rejection of each of these dependent claims because its base
4 claim is allowable.

5
6 Claim 11

7 With the cited portions of **Schweitz** provided in brackets, this claim recites
8 [with emphasis added]:

- 9
- 10 • computing a procedure-match-criterion for each procedure in
11 the second CFG representation, where the procedure-match-
12 criterion for a procedure in the second CFG representation
13 represents the number of matching blocks between that
14 procedure and a specified procedure in the first CFG
15 representation; [col. 8, lines 47-67 and col. 9, lines 1-19]
 - 16 • matching procedures in the second CFG representation with
17 the specified procedure in the first CFG representation based
18 upon the procedure-match-criteria for the procedures in the
19 second CFG representation. [col. 10, lines 30-43]

20 Applicant submits that the cited portions of **Schweitz** do not disclose the
21 recited language. The recited claim language specifies that a “procedure-match-
22 criterion” is to be computed. In particular, the criterion for a second CFG
23 representation “represents the number of matching blocks between that procedure
24 and a specified procedure in the first CFG representation.”

25

1 Schweitz does not discuss or address the concept of a “procedure” as
2 recited in the claim. Instead, the **Schweitz** discloses operations on a “node” or
3 “function” level. As indicated, at col. 5, lines 56-57, “nodes” and “functions” are
4 synonymous in **Schweitz**. Therefore, the reference never discusses a comparison
5 or operation performed at a higher level, such as the “procedure” level.

6 Just to clarify, Applicant has amended the preamble of claim 11 to include
7 this language: “wherein a procedure comprises multiple blocks in a CFG
8 representation.” Such amendment does not narrow the scope of the claim.

9 As shown above, **Schweitz** does not disclose all of the claimed elements
10 and features of the claim. Accordingly, Applicant asks the Office to withdraw its
11 rejection of this claim.

12
13 Claim 12

14 This claim ultimately depends upon independent claim 11. As discussed
15 above, claim 11 is allowable.

16 In addition to its own merits, each of this dependent claim is allowable for
17 the same reasons that its base claim is allowable. Applicant submits that the
18 Office withdraw the rejection of this dependent claim because its base claim is
19 allowable.

Claim 18

With the cited portions of **Schweitz** provided in brackets, this amended claim recites [with emphasis added]:

- obtaining a first control flow graph (CFG) representation of the first binary and obtaining a second CFG representation of the second binary; [Fig. 2, item 150 and 155]
- comparing the first and second CFG representations to identify blocks (nominally matched blocks) that match in the first and second CFG representations, thereby identifying blocks (nominally unmatched blocks) in the second CFG representation that do not match in the first CFG representation [Col. 4, lines 28-29], *the comparing being based upon content of blocks being compared and local neighborhoods of blocks surrounding blocks being compared, wherein a local neighborhood of a particular block consists of blocks neighboring that block in a CFG representation, but less than all the blocks in that CFG representation;*
- determining edit-operations that merges the unmatched blocks into the first CFG representation so that first CFG representation is substantially identical to the second CFG representation; [Col. 4, lines 29-32]
- producing a delta comprising the unmatched blocks and the edit-operations. [Col. 4, lines 11-15]

1 Applicant submits that **Schweitz** does not disclose that the comparison is
2 “based upon content of blocks being compared and local neighborhoods of blocks
3 surrounding blocks being compared, wherein a local neighborhood of a particular
4 block consists of blocks neighboring that block in a CFG representation, but less
5 than all the blocks in that CFG representation.”

6 Indeed, **Schweitz** is silent on the subject of neighborhoods of blocks and
7 any comparison related to them.

8 As shown above, **Schweitz** does not disclose all of the claimed elements
9 and features of the claim. Accordingly, Applicant asks the Office to withdraw its
10 rejection of this claim.

11
12 Claims 19-20

13 These claims ultimately depend upon independent claim 18. As discussed
14 above, claim 18 is allowable.

15 In addition to its own merits, each of these dependent claims is allowable
16 for the same reasons that its base claim is allowable. Applicant submits that the
17 Office withdraw the rejection of each of these dependent claims because its base
18 claim is allowable.

19
20 Claim 21

21 With the cited portions of **Schweitz** provided in brackets, this amended
22 claim recites [with emphasis added]:

- 23 • a comparator that is configured to compare a first control flow graph
24 (CFG) representation of a first program binary and a second CFG
25

representation of the second program binary for identifying blocks (nominally matched blocks) that match in the first and second CFG representations, thereby identifying blocks (nominally unmatched blocks) in the second CFG representation that do not match in the first CFG representation [Col. 4, lines 28-29], the comparison being based upon content of blocks being compared and local neighborhoods of blocks surrounding blocks being compared, wherein a local neighborhood of a particular block consists of blocks neighboring that block in a CFG representation, but less than all the blocks in that CFG representation;

- an edit-op determiner configured to determine the edit-operations that merges the unmatched blocks into the first CFG representation so that first CFG representation is substantially identical to the second CFG representation; [Col. 4, lines 29-32]
- an output sub-system that is configured to produce a delta comprising the unmatched blocks and the edit-operations. [Col. 4, lines 11-15]

Applicant submits that **Schweitz** does not disclose that the comparison is “based upon content of blocks being compared and local neighborhoods of blocks surrounding blocks being compared, wherein a local neighborhood of a particular block consists of blocks neighboring that block in a CFG representation, but less than all the blocks in that CFG representation.”

Indeed, **Schweitz** is silent on the subject of neighborhoods of blocks and any comparison related to them.

1 As shown above, **Schweitz** does not disclose all of the claimed elements
2 and features of the claim. Accordingly, Applicant asks the Office to withdraw its
3 rejection of this claim.

4
5 Claim 22

6 This claim ultimately depends upon independent claim 21. As discussed
7 above, claim 21 is allowable.

8 In addition to its own merits, each of this dependent claim is allowable for
9 the same reasons that its base claim is allowable. Applicant submits that the
10 Office withdraw the rejection of this dependent claim because its base claim is
11 allowable

12
13 **Obviousness Rejections**

14
15 **Lack of *Prima Facie* Case of Obviousness (MPEP § 2142)**

16 Applicant disagrees with the Office's obviousness rejections. Arguments
17 presented herein point to various aspects of the record to demonstrate that all of
18 the criteria set forth for making a *prima facie* case have not been met.

19
20 **Based upon Schweitz and Chipman**

21 The Office rejects claims 5, 8, 10, and 13-15 under USC § 103(a) as being
22 unpatentable over **Schweitz** in view of **Chipman**. Applicant respectfully traverses
23 the rejections of these claims. Applicant asks the Office to withdraw its rejection
24 of these claims.

No Motivation to Combine References

Applicant asserts that there is no motivation to combine the teachings of **Schweitz** and the teachings of **Chipman**.

As it states in its title, **Schweitz** describes techniques for creating a software patch by comparing object files. In its rejections, the Office relies on **Schweitz** to disclose aspects in the field of patching software programs.

On the other hand, **Chipman** describes techniques related to computer vision, which may be defined as “the analysis of image content--the conversion of pictures into descriptions.” In particular, **Chipman** is addressing problems associated with computer vision tasks such as automated navigation, object location in the real world, pictorial databases, and character recognition.

While both references to utilize graphs to some degree, there is no suggestion, teaching, or reason given by one reference that would motivate one of ordinary skill in the art at the time of the invention (hereinafter, “OOSA”) to combine it with the teachings of the other reference.

Schweitz says nothing that would motivate OOSA to look towards **Chipman** and combine their teachings. **Schweitz** is silent on the subject of neighborhoods of nodes and the field of computer vision.

Likewise, **Chipman** says nothing that would motivate OOSA to look towards **Schweitz** and combine their teachings. **Chipman** is silent on the field of software patches.

1 Applicant submits that the Office cannot maintain these rejections without
2 addressing these questions with specificity and particularly:

- 3 • When attempting to solve a problem in the field of patching software
4 programs, why would OOSA be motivated to look towards a
5 document focused on computer vision?
- 6 • More precisely, what objective evidence exists in these references
7 that would motivate OOSA to look towards the other reference?

8
9 Accordingly, Applicant submits that OOSA would not be motivated to
10 combine the software patching techniques of **Schweitz** with the computer vision
11 techniques of **Chipman**.

12
13 Claim 5

14 This claim ultimately depends upon independent claim 1. As discussed
15 above, claim 1 is allowable.

16 In addition to its own merits, each of this dependent claim is allowable for
17 the same reasons that its base claim is allowable. Applicant submits that the
18 Office withdraw the rejection of this dependent claim because its base claim is
19 allowable

Claim 8

With the cited portions the references provided in brackets, this claim recites:

- matching blocks between the first and second CFG representations based upon the content of the blocks; [Schweitz: Fig. 3C]
- detecting outliers, wherein outliers are blocks in the first CFG representation that do not match any block in the second CFG representation during the matching step; [Schweitz: col. 4, lines 29-32]
- computing a neighborhood of each block in the first and second CFG representations by performing a breadth first traversal; [Chipman: page 28-31]
- removing the outliers from each neighborhood. [Schweitz: col. 1, lines 25-28 and col. 4, lines 29-32; Office rephrases this element of the claim to read, “removing outliers by means of a patch.”]

The Office admits that **Schweitz** does not disclose “computing a neighborhood of each block in the first and second CFG representations by performing a breadth first traversal,” but indicates that **Chipman** does.

Based on this, the Office concludes that it would have been obvious to

“perform the method of matching blocks across the first and second CFG representations upon blocks being compared, detecting outliers, and removing outliers by means of a patch, as thought by **Schweitz**, further computing a neighborhood of each block in the first and second CFG representations by performing a breadth first traversal, as thought by

1 Chipman, since this allows a comparison of blocks surrounding a given
2 block to be computed, marking matching blocks easier and more
3 accurate."

4 The Office does not explain how or why OOSA would be motivated to
5 combine the relevant teachings of **Schweitz** and **Chipman**. More specifically, the
6 Office does not cite any specific objective evidence in the cited references that
7 would motivate OOSA to combine the relevant teachings of the references to
8 produce the recited features and elements of these claims.

9 While a technical dictionary may disclose every particular structural feature
10 recited in a claim, Applicant submits that a proper obviousness rejection must still
11 show sufficient objective evidence as to a teaching, suggestion, or motivation to
12 combine such structural features – not solely as individual elements – but as
13 recited in the claims.

14 Applicant respectfully submits that the Office has not presented objective
15 and specific evidence sufficient to support a motivation to combine the relevant
16 teachings of **Schweitz** and **Chipman**.

17 Accordingly, Applicant asks that the Office withdraw its rejection of these
18 claims.

19
20 Claims 9-10

21 These claims ultimately depend upon independent claim 8. As discussed
22 above, claim 8 is allowable.

23 In addition to its own merits, each of these dependent claims is allowable
24 for the same reasons that its base claim is allowable. Applicant submits that the
25

1 Office withdraw the rejection of each of these dependent claims because its base
2 claim is allowable.

3
4 Claim 13

5 With the cited portions the references provided in brackets, this claim
6 recites:

- 7 • matching blocks between the first and second CFG
8 representations based upon the content of the blocks;
9 [Schweitz: Fig. 3C]
- 10 • computing successively smaller neighborhoods of each block
11 in the first and second CFG representations via breadth first
12 traversals; [Chipman: page 28-31]
- 13 • for each neighborhood computed in the computing step,
14 forming a “d-label” for each block in a neighborhood based
15 upon the labels labels of the blocks within the neighborhood;
16 [Schweitz: col. 9, lines 1-3]
- 17 • attempting to match blocks between first and second CFG
18 representations by comparing the d-labels of the blocks.
19 [Schweitz: col. 9, lines 1-3]

20
21 The Office admits that **Schweitz** does not disclose “an algorithm that
22 assumes a large neighborhood and computes successively smaller neighborhoods
23 in a CFG representation,” but indicates that **Chipman** does.

24 Based on this, the Office concludes that it would have been obvious to
25

1 “perform the method of matching blocks across the first and second CFG
2 representations upon blocks being compared and forming labels for
3 blocks and matching blocks in the first and second CFG based upon the
4 label of the block, as thought by **Schweitz**, further computing
5 successively smaller neighborhoods of each block in the first and second
6 CFG’s via breadth first traversals, as thought by **Chipman**, since this
7 computes a maximal sized perfectly matched neighborhood surrounding
8 the current blocks.”

9 The Office does not explain how or why OOSA would be motivated to
10 combine the relevant teachings of **Schweitz** and **Chipman**. More specifically, the
11 Office does not cite any specific objective evidence in the cited references that
12 would motivate OOSA to combine the relevant teachings of the references to
13 produce the recited features and elements of these claims.

14 While a technical dictionary may disclose every particular structural feature
15 recited in a claim, Applicant submits that a proper obviousness rejection must still
16 show sufficient objective evidence as to a teaching, suggestion, or motivation to
17 combine such structural features – not solely as individual elements – but as
18 recited in the claims.

19 Applicant respectfully submits that the Office has not presented objective
20 and specific evidence sufficient to support a motivation to combine the relevant
21 teachings of **Schweitz** and **Chipman**.

22 Accordingly, Applicant asks that the Office withdraw its rejection of these
23 claims.
24
25

Claims 14-15

These claims ultimately depend upon independent claim 13. As discussed above, claim 13 is allowable.

In addition to its own merits, each of these dependent claims is allowable for the same reasons that its base claim is allowable. Applicant submits that the Office withdraw the rejection of each of these dependent claims because its base claim is allowable.

1 **Dependent Claims**

2 In addition to its own merits, each dependent claim is allowable for the
3 same reasons that its base claim is allowable. Applicant submits that the Office
4 withdraw the rejection of each dependent claim where its base claim is allowable.
5

6 **Conclusion**

7 All pending claims are in condition for allowance. Applicant respectfully
8 requests reconsideration and prompt issuance of the application. If any issues
9 remain that prevent issuance of this application, the Office is urged to contact the
10 undersigned attorney before issuing a subsequent Action.
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12
13
14 Dated: 6-4-2004
KCC

Respectfully Submitted,

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